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WINTER FIELD PEAS: THEIR VALUE AS A WINTER COVER AND GREEN-MANURE CROP

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GRAY WINTER FIELD PEA

WINTER-HARDINESS TESTS

An importation of the Gray Winter field pea (S. P. I. No. 1486) was received by the United States Department of Agriculture in December, 1898. This seed was purchased by W. T. Swingle, of the department, from Vilmorin-Andrieux & Co., Paris, France, and was described by them as being more hardy than the spring field peas, better suited to dry and gravelly lands, and usually sown in September or October. In testing it, however, the suggested date of seeding was not observed, and the variety was grown in comparison with other field peas as a spring-sown crop in the northern part of the United States. Under these conditions it appeared to be of little value.

From the 1898 importation sown at Pullman, Wash., an increased quantity of seed was returned to the Department of Agriculture and assigned S. P. I. No. 16436, on November 14, 1905. During the period from 1906 to 1918, tests of this variety were made at the Arlington Experiment Farm, near Washington, D. C., and at West Branch, Mich., Hays, Kans., Akron, Colo., Mitchell, Nebr., Moccasin, Mont., Pullman, Wash., Moro and Hood River, Oreg., Chico, Calif., and San Antonio, Tex. The seedings at Hays, Hood River, Chico, and San Antonio were made in the fall; at the other points spring seeding was practiced. In all of the comparisons with other varieties

when sown in the spring, Gray Winter was only fair to poor; in the fall seedings, however, it always proved superior to other varieties in hardiness.

At Hays, Kans., sown October 8, 1913, with four other varieties of peas, Gray Winter was the only one which survived the winter, in which a minimum temperature of −10° F. was recorded on February 7 with very little snow covering. The tests were continued for several years, but on account of winterkilling, the stand in the spring was usually very thin, so that the peas were not deemed profitable to grow there in rotation with corn and wheat. Seeded in the upper Hood River Valley in the fall of 1911, the Gray Winter pea survived a winter in which temperatures of −10° F. were recorded. These low temperatures occurred, however, when there was an abundance of snow on the ground. At Chico, Calif., hardiness is not an important factor, and it is a common practice to sow all varieties in the fall. The Gray Winter pea sown in November made less growth during the winter than the less hardy varieties and was usually not more than 6 inches tall by March 1 of the following year. If allowed to continue its growth until May or June the variety made a much better showing, reaching a height of 36 inches and in 1907 making a yield of 14¾ tons of green matter to the acre. The cropping system in that part of California, however, demands a crop that can be plowed under in March, for which purpose this variety is of little value.

At San Antonio, Tex., the Gray Winter pea seeded in November proved to be the most hardy of all varieties. The winter of 1915–16 was favorable for testing the hardiness of the different varieties. Warm weather prevailed during the first part of January, and sufficient rainfall was received to produce a good growth of vines. This favorable weather was followed by two cold periods, one in the latter part of January and the other early in February. Partridge, Delano, French Gray, and Bluebell were killed entirely, and Golden Vine, Kabilya, Agnes, Andes, Canadian Beauty, Peluschka, Colorado, Scotch Blue, Berryman, Boerne, and Kerrville were injured severely. The last three were varieties that had been grown for some years in the vicinity of San Antonio. The Gray Winter was uninjured by either cold period, and the Kaiser, although slightly frosted at the growing point, survived without serious injury. The superior hardiness of the Gray Winter was demonstrated in these tests. In the eight seasons during which the experiments were in progress the field peas produced fair to good growth in five and practically none in three seasons. The winters are often dry, and if the rainfall is low in the spring also it is often difficult to obtain a good stand of the following crop after the peas are plowed under. The effect of the green-manure crop on the yields of cotton and sorghum has been negligible; therefore, the practice has been abandoned.

Until 1921 there were no tests of the Gray Winter field pea in the Southeastern States. In that year eight varieties of peas were seeded on November 2 at the Georgia Coastal Plain Experiment Station at Tifton, Ga. This experiment, besides the Gray Winter, included the Blue Prussian, Golden Vine, Gregory, Paragon, Kaiser, Chang, and Bangalia. The winter of 1921-22 was mild, and most of

the varieties in the test made a favorable showing. The following season also good growths were made by all varieties, but because of a dry spring the grain yields were low. In the third season there was a very sudden drop in temperature on January 6 to 12° F., and all varieties except the Gray Winter were completely killed. All the Fulghum oats seeded in mixture with the peas were killed, but the injury to the Gray Winter peas was only 5 to 10 per cent. In the fall of 1924 the usual seedings were made, but good yields were obtained only from the Gray Winter. Other varieties succumbed to the drought which prevailed in southern Georgia during the spring of 1925.

DESCRIPTION

Gray Winter belongs to that group of field peas which has colored flowers and dark-colored seeds, usually classified by botanists as *Pisum arvense*. The seedlings often seem weak and small, and the early growth is slow. In the spring, however, the growth is rapid, and the period elapsing from the time the plant comes into bloom until it matures its seed is less for Gray Winter than for most other varieties. On good soil the vines average from 30 to 36 inches in height, are semierect, and medium to slender, with dark-red or purple leaf axils and a decided purple color throughout. This color is present also in the flowers, which have lavender-pink standards and reddish purple wings. The seeds are rather small, indented, somewhat crowded in the pod, with a ground color of olive buff marbled with cinnamon or hazel brown. The hilum is black, the cotyledons are chrome yellow, and the number of seeds per pod varies from three to five.

The above description fits the Austrian Winter pea also, except that the seeds of the latter are usually smaller and darker in color than those of Gray Winter. Grown side by side at the Arlington Experiment Farm, near Washington, D. C., it was scarcely possible to distinguish between the two varieties.

AUSTRIAN WINTER FIELD PEA

The success with the Gray Winter pea at Tifton, Ga., the first season, 1921–22, awakened an interest in the use of these peas as a winter cover and green-manure crop for the Coastal Plain section, but the scarcity of seed seemed to preclude an extensive trial of the variety. About this time (February, 1922) a New York seed firm which had been actively searching for a substitute for hairy vetch became interested in European winter peas because the seed could be purchased for very much less than the seed of hairy vetch. In July, 1922, they announced their intention of importing seed of the Austrian Winter pea, and some of this seed on its arrival was obtained by the United States Department of Agriculture in order to compare it with the Gray Winter and other varieties of field peas. This firm has continued each year to import increasing quantities of the Austrian Winter pea, which resembles very closely the Gray Winter in its habit of growth and its floral and seed characters as well as in its winter hardiness.

The Austrian Winter appears to be one of the numerous strains of so-called European winter peas, which are described by the Hamburg Botanical Museum as follows:

It is an excellent green-fodder plant and has given very good results so far, fertilizing the soil, especially heavy soil. The Latin name is *Pisum arvense*. It has likewise been found that these peas should be planted early in the fall, immediately or soon after the first harvest of new grain, as long as the soil is moist, in order to germinate in as short a time as possible. The quick improvement of the young plant should not be interfered with through dry weather or too much warm weather nor through unusually wet or raw fall weather. Most convenient are mild locations with late fall and likewise in fields which are free of weeds. The winter peas are stronger, resisting sharp frosts without a snow cover, but are liable to suffer in the spring when the weather is changing to mild, through the change from frost and thaw.

For broadcasting they plant for 1 hectare, equal to 10,000 square meters, 225 to 345 kilos. Therefore, it would be necessary for 1 acre, which is equal to 4,050 quadratmeters, to plant from 200 to 300 pounds per acre. The smaller quantity is usually used when planted early and the larger quantity when planted late in the fall.

These winter peas, in common with other varieties of field peas, probably originated in southwestern Asia and were distributed from that center in early times to the nations both east and west in temperate latitudes. Seed of what appears to be the same variety of pea was obtained from Ispahan, Persia, in 1906. Frank Benton, who sent the seed, describes the pea as follows:

A cloverlike plant grown as a forage crop around Ispahan and known as guergueruh. It is said to be an annual and seems to be used as a winter cover for the land, the same as crimson clover in the United States. The plants are quite green in January after numerous frosts.

Other importations of this same type of pea have been made from Tibet, India, and China.

RESULTS OF FIELD TESTS

The experiments with the Austrian Winter variety of field pea have not been comprehensive enough to establish its value in different sections of the United States. Taken in connection with the results obtained with the Gray Winter they indicate a possible field of usefulness for winter field peas in the Atlantic and Gulf Coastal Plains and on the Pacific slope. It has been found impossible to correlate the limited data available in the customary way; hence the information is presented simply as abstracts or actual quotations from the reports made by the experiment-station men who conducted the tests. These reports are combined into three groups for the convenience of the reader: (1) Results in the Central States, (2) results on the Pacific slope, (3) results on the Atlantic and Gulf Coastal Plains.

RESULTS IN THE CENTRAL STATES

C. R. MEGEE, AGRONOMIST, MICHIGAN AGRICULTURAL COLLEGE, EAST LANSING

Season of 1923–24.—The Austrian Winter pea came through the winter in good shape. We did not harvest this pea in the green stage; consequently, I can not give you the weight of green material. The growth, however, was quite comparable to that of hairy vetch.

Season of 1924–25.—The extremely dry weather which began in September and continued during the entire fall prevented the peas from germinating properly. The stand was so poor that the plats were plowed up in the spring.

G. W. PUTNAM, DIRECTOR, UPPER PENINSULA EXPERIMENT STATION, CHATHAM, MICH.

Season of 1923–24.—None of the plats seeded to this field pea came through with any percentage of stand whatever, there being only an occasional plant which survived the winter.

M. W. EVANS, ASSOCIATE AGRONOMIST, OFFICE OF FORAGE-CROP INVESTIGATIONS, NORTH RIDGEVILLE, OHIO

Season of 1923–24.—The peas winterkilled completely, so that no yields were obtained.

Season of 1924–25.—On September 17, 1924, one plat was seeded to peas alone at the rate of 200 pounds per acre and one plat to a mixture of peas and rye—180 pounds of peas and 100 pounds of rye. The seed was disked in and a fair stand obtained.

These plats were examined April 1, 1925, and it was found that only 25 per cent of the plants had survived where the peas were sown alone. Most of the plants which remained were heaved out of the soil more or less. On some plants the remains of the seeds from which they grew were about 1 inch above the surface of the soil. Where the peas were sown with rye there was somewhat less winterkilling than where sown alone. The growth of the rye was relatively more vigorous than that of the peas, and this to some extent at least may have prevented the peas from heaving out of the soil. The alternate freezing and thawing of the clay-loam soil at North Ridgeville seems to be the most destructive feature of the climate there.

The plants which survived the winter were almost all located just above the tile drain; between these drains there were scarcely any peas. Poor drainage is perhaps a contributing factor in the failure of the peas at North Ridgeville.

E. J. KINNEY, ASSOCIATE AGRONOMIST, KENTUCKY AGRICULTURAL EXPERIMENT STATION, LEXINGTON

Season of 1924–25.—Six plats of the peas were sown in the fall of 1924—three of the peas alone and three in mixture with winter barley. There were only scattering peas left in the spring (1925), about one plant in each 2 square yards, where the peas were seeded alone. In the mixture with barley the stand was a little better, but not enough to make a yield of any importance.

There were temperatures of about zero once or twice without much protection, but the winter barley in the mixture survived the winter in good condition, which would indicate that the winter was not a severe one. The peas which lived through until spring made a fair growth and were inoculated. In view of this experience, it is believed that it will not pay us to attempt the use of these winter peas here at Lexington.

MARTIN NELSON, DIRECTOR, ARKANSAS AGRICULTURAL EXPERIMENT STATION, FAYETTEVILLE

Season of 1924–25.—One plat of peas was sown in the fall of 1924 and germinated to a good stand. The winter weather was rather severe, and the spring very dry, but the peas survived better than hardy varieties of winter oats. They made a hay yield of 2,400 pounds per acre, but produced only 200 pounds per acre of seed. The seed yield was limited by dry weather at fruiting time.

R. E. SHEPHERD, TWIN FALLS NORTH SIDE LAND & WATER CO., JEROME, IDAHO

Season of 1924–25.—During the fall of 1924 this locality did not have sufficient water to irrigate properly. We were completely without water after midsummer of that year. Under the above conditions the Austrian Winter peas sown in the fall were a complete failure. The shortage of water may have had much to do with this result.

A. E. M'CLYMONDS, SUPERINTENDENT, ABERDEEN (IDAHO) AGRICULTURAL EXPERIMENT STATION

Season of 1923–24.—The peas were sown in the fall of 1923, when irrigation water was scarce, and just barely germinated, failing to emerge until the spring of 1924. With this late start the Austrian Winter pea produced 5,200 pounds of hay per acre, equal to at least 7,000 pounds green weight.

Season of 1924–25.—The peas were sown with a grain drill at the rate of 180 pounds per acre September 23, 1924, on sandy clay loam soil in excellent condition. They germinated to a good stand in the fall, but winter conditions were so severe—minimum temperature of —30° F. on December 19—that 60 per cent of the peas winterkilled. Winter wheat winterkilled also, and both crops were considered failures and plowed up April 21, 1925.

RESULTS ON THE PACIFIC SLOPE

H. A. SCHOTH, ASSOCIATE AGRONOMIST, OFFICE OF FORAGE-CROP INVESTIGATIONS, CORVALLIS, OREG.

Season of 1923–24.—The peas were seeded in the latter part of October, 1923. An almost perfect stand was obtained, which maintained itself throughout the winter and withstood without injury a minimum temperature of 6° F. with only one-quarter inch snow protection and frozen ground beneath. Part of the planting was cut while the plants were still blooming but when the lower pods were filled. The yield, green weight, was 12.25 tons per acre. Judging by its behavior this season the Austrian Winter pea has great possibilities for this section.

Season of 1924–25.—The peas were sown October 8, 1924, alone at the rate of 100 pounds of seed per acre and in mixture with winter oats, 100 pounds of peas and 40 pounds of oats per acre. Some exceptionally severe winter weather occurred in the early part of January, 1925. This storm, which apparently centered in the Pacific Northwest, lasted for over two weeks. It began with a light snow and severe freezing weather. During this stage there was a minimum temperature of —3½° F. with not enough snow for crop protection. The temperature remained near zero for several days, the ground freezing deeper and deeper. After a week of this an 8-inch snowfall came and the temperature dropped to —8° F. The ground froze to a depth of 12 inches, but there was no alternate freezing and thawing, so no heaving took place. Horse beans, kale, winter barley, purple vetch, Tangier peas, and pearl vetch were completely killed. Winter oats, common vetch, winter wheat, and many fruits were injured, but hairy, Hungarian, woolly-pod, and monantha vetches were damaged very little. The Austrian Winter peas lived through this trying period practically undamaged, although most of the oats in the mixture were killed.

The peas were harvested June 18, 1925, when the lower pods were filled and the oats were in the soft-dough stage. The yields, green weight, were for the peas alone 12.65 tons and in mixture with winter oats 14.16 tons per acre. It was estimated that 85 per cent of the latter yield was peas.

Spring seeding of the Austrian Winter peas was tested by sowing two plats, one alone and one in mixture with Victory oats, March 10, 1925. These plats were harvested July 3 to 6 at the same stage of maturity as the fall-sown peas. The yield, green weight, for the peas alone was 6.25 tons and for the peas and oats 8.86 tons per acre; 55 per cent of the latter yield was peas.

The peas when sown in the spring seem inclined to hasten their maturity and do not grow so large as when seeded in the fall. The fall-sown peas in mixture with winter oats make a good silage crop.

W. B. CAMP, AGRONOMIST, OFFICE OF CROP ACCLIMATIZATION AND ADAPTATION INVESTIGATIONS, SHAFTER, CALIF.

Seasons of 1923–24 and 1924–25.—The yields of Austrian Winter pea in comparison with other leguminous winter cover crops in the southern part of the San Joaquin Valley are indicated in Table 1. All the crops were seeded each year about September 15 and harvested the following year, approximately the middle of March.

TABLE 1.—*Yields of various winter cover crops grown at Shafter, Calif., for two seasons*

Variety	Season of 1924–25				Acre yields, green weight (tons)		
	Stand	Condition at harvest time			1924–25	1923–24	Average
		Bloom	Foliage	Height (inches)			
Austrian Winter pea	Fair	None	Dense	30	19.17	14.38	16.78
Gregory field pea	Good	5 per cent.	do	48	27.44	13.94	20.69
Tangier pea	Fair	None	do	36	13.07	19.60	16.34
Monantha vetch	Excellent	do	do	36	28.31	21.78	25.05
Hungarian vetch	Fair	do	Fairly dense	24	17.21	10.89	14.05
Purple vetch	do	do	do	40	15.46	14.81	15.14
Hairy vetch	Good	do	Dense	24	20.69	16.12	18.41
Woolly-pod vetch	Very poor	do	Sparse	2–20	8.71	21.34	15.03
Common vetch	Good	do	Dense	30	24.61	14.38	19.50
Melilotus indica	Fair	do	Fairly dense	35	15.25	19.60	17.43

The crops were all harvested before they had attained their maximum growth, as indicated by the lack of bloom. The Austrian Winter pea develops rather slowly, and its relative yield would no doubt have been larger if it

FIG. 1.—Mixture of Austrian Winter field peas and rye on the Arlington Experiment Farm, near Washington, D. C., sown October 10, 1923; photographed June 14, 1924. The yield, green weight, was 8.75 tons per acre

had been allowed to reach the full-bloom stage before being harvested. In California the general practice of plowing under green-manure crops in March makes it desirable to take the yields at that time.

RESULTS ON THE ATLANTIC AND GULF COASTAL PLAINS

H. N. VINALL, AGRONOMIST, OFFICE OF FORAGE-CROP INVESTIGATIONS, ARLINGTON EXPERIMENT FARM (NEAR WASHINGTON, D. C.)

Season of 1923–24.—Two plats were sown October 10, 1923—one plat with peas alone at 200 pounds per acre and one with a mixture of peas and rye, 150 pounds of the peas and 50 pounds of rye per acre. These plats were both cut June 23, 1924. The peas alone made a yield, green weight, of 12,000 pounds per acre. The mixed peas and rye yielded 17,530 pounds per acre. Climatic conditions at the Arlington Experiment Farm during this season were about normal. The actual minimum temperature was 7° F. on January 22. The rainfall during the growing season, October 1, 1923, to June 30, 1924, was 34.05 inches. The peas had attained their maximum growth at least two weeks before they were harvested. (Figs. 1 and 2.) The mixture of peas and rye

lodged very little and remained healthy until harvested. The peas alone lodged considerably, and where they went down badly there was some injury from mildew.

Season of 1924–25.—A plat of rye alone and another plat of rye and peas were sown September 27, 1924. The rye was sown at the rate of 70 pounds per acre and the mixture at the rate of 50 pounds of rye plus 150 pounds of peas per acre. This seeding was followed by a heavy rain, which formed a hard crust on the soil, and a very poor stand resulted. The plats were then disked up and reseeded at the same rate on October 14. This second seeding produced a thin stand, which made a rather slow growth prior to April 15, 1925, after which the peas grew rapidly and were in full bloom on May 26. The peas lodged but little, being supported by the rye, which held them erect until they had attained what appeared to be their maximum growth. They were harvested on May 28.

When harvested the peas were 36 to 42 inches tall and the rye 55 to 60 inches. The yield per acre, green weight, of the rye alone was 8,600 pounds, containing 3,300 pounds of dry matter, and that of the rye and peas mixed, 14,565 pounds, containing 4,620 pounds of dry matter. The yield would have been larger if the stand of peas had been thicker. The minimum temperature for the season from October 1, 1924, to May 30, 1925, was —3° F. on January 28,

FIG. 2.—Austrian Winter field peas on the Arlington Experiment Farm, near Washington, D. C., sown October 10, 1923; photographed June 14, 1924. The yield, green weight, was 6 tons per acre

and the total rainfall was 15.65 inches. Very little winterkilling of the peas was noted.

R. P. COCKE, SUPERINTENDENT OF SUBSTATION, WILLIAMSBURG, VA.

Season of 1923–24.—We seeded this pea here November 5, 1923. This date of seeding proved to be too late for some of the varieties of oats and one variety of vetch, for they were killed by severe freezing. The Austrian pea was not at all killed by cold and appeared to be a very hardy plant. It made an early growth in the spring and grew to a height of 36 to 40 inches. We made the mistake of not getting enough seed on the ground and for this reason did not have what would have made a large tonnage per acre had it been cut and cured for hay. With a good stand on the land I believe that this pea will cut 1½ tons of cured hay per acre. Our stand being so thin, we did not cut and weigh our growth, but let it mature seed, and with a very thin stand of plants have threshed seed at the rate of 10 bushels per acre.

Season of 1924–25.—Sown November 1, 1924, in soil low in fertility, occupied a few years ago by pine brushes and broom sedge. The peas on this poor soil were well inoculated and there was no winterkilling, but the growth was poor and the yield only 2 tons per acre, green weight. Farmers in the vicinity of Williamsburg who planted the pea were well pleased with the crop. Reports for the Westmoreland County substation near Montross, Va., state that 75 per cent of the peas winterkilled.

T. B. HUTCHESON, AGRONOMIST, VIRGINIA AGRICULTURAL EXPERIMENT STATION

Season of 1924–25.—Austrian Winter pea seeded in the fall of 1924 at Martinsville, Va., produced 1.18 tons, and hairy vetch only one-half ton of hay per acre. Seed was harvested at the rate of 7 bushels per acre, although two-thirds of the seed was probably lost by shattering.

R. W. HAMILTON, EXTENSION DEPARTMENT, CLEMSON AGRICULTURAL COLLEGE, S. C.

Clemson College, S. C., season of 1924–25.—The peas were sown October 10, 1924, and fertilized with 300 pounds per acre of 8–3–3 commercial fertilizer. They were harvested June 6, 1925, and the yield of peas sown alone was 3,717 pounds of hay per acre, while the mixture of peas and rye yielded 5,772 pounds of hay per acre. The rye ripened three weeks earlier than the peas. The peas should be inoculated in South Carolina.

Aiken, S. C., season of 1924–25.—Peas in mixture with rye sown by M. J. Quattlebaum on October 15, 1924, gave an estimated yield of 2,500 pounds of hay per acre. Peas sown alone by C. B. Woolsley gave an estimated yield of 4,000 pounds of hay per acre. Nothing is said about the character of the soil or the fertilizers used in either case.

Camden, S. C., season of 1924–25.—The peas were sown alone by J. W. Sanders in November, 1924, and the yield harvested the following spring was 3,000 pounds of hay per acre.

W. J. DAVIS, AGRONOMIST, COASTAL PLAIN EXPERIMENT STATION, TIFTON, GA.

Season of 1921–22.—The results obtained in a test of field-pea varieties at the Coastal Plain Station are shown in Table 2. Seedings were made November 2, 1921, and the seed was inoculated with a commercial culture.

TABLE 2.—*Test of field-pea varieties at the Coastal Plain Station, Tifton, Ga.*

Variety	Date of—		Flowering to maturity (days)	Seed yield per acre (bushels)	Growing season (days)
	Flowering	Maturity			
Blue Prussian	Feb. 15	Apr. 25	69	15.8	174
Gray Winter	Mar. 16	May 1	46	13.3	180
Golden Vine	Feb. 9	Apr. 15	65	12.4	164
Gregory	Mar. 28	May 10	43	11.5	189
Kaiser	Feb. 20	May 17	86	10.3	197
Paragon	Mar. 18	May 4	47	10.0	183
Chang	Mar. 16	May 1	46	9.7	180
Bangalia	Feb. 11	Apr. 25	73	2.6	174

In the season of 1922–23 the grain yields of all varieties were very much less than in the preceding year, because the spring of 1923 was very dry. The yields in bushels per acre were as follows: Blue Prussian, 2; Gray Winter, 5.2; Golden Vine, 3.4; Gregory, 1.7; Kaiser, 2.1; Paragon, 2.3. The remaining two, Chang and Bangalia, yielded nothing.

In the 1923–24 season all the varieties except Gray Winter were killed by the freeze of January 6, 1924; it produced only 3 bushels of seed. The 1924–25 season was unfavorable also, on account of the extreme drought during the spring of 1925, and the grain yields from seedings made on November 1, 1924, were almost nothing. Earlier seedings made some seed. The vegetative growth of the Gray Winter was good both in 1924 and 1925, but the yields (green weight) were not obtained.

W. E. STOKES, GRASS AND FORAGE CROPS SPECIALIST, FLORIDA AGRICULTURAL EXPERIMENT STATION, GAINESVILLE

Season of 1924–25.—The results obtained in Florida on the different soil types[1] were as follows:

Norfolk sand at Gainesville—failure.

Portsmouth soil at Gainesville—failure.

[1] Bryan, O. C. The soils of Florida, a preliminary report. Fla. Agr. Ext. Div. Bul. 42, 26 pp., illus. 1925.

Bladen fine sandy loam at Jacksonville—produced an excellent growth and an estimated yield of 1 ton of hay per acre. Plants began to bloom at a height of 12 to 20 inches on March 30.

Orangeburg soil at Quincy sown with oats—failure. Sown alone—produced only a light crop, estimated at one-half ton per acre.

Norfolk fine sand in Duval County—failure.

Downy mildew injured severely the Austrian Winter pea as well as other varieties this season.

M. J. FUNCHESS, DIRECTOR, ALABAMA AGRICULTURAL EXPERIMENT STATION, AUBURN

Season of 1923—24.—The pea made a satisfactory showing. A minimum temperature of 6° F. was recorded during the winter. This low temperature almost completely wiped out winter oats, vetches (except hairy vetch), and most of the crimson and bur clovers. The Austrian Winter pea was severely injured, but finally recovered and made a good growth on the sandy land.

J. T. WILLIAMSON, ASSOCIATE AGRONOMIST, ALABAMA AGRICULTURAL EXPERIMENT STATION, AUBURN

Season of 1924–25.—The peas were sown broadcast October 28, 1924, at 40 pounds per acre, disked in. The rainfall during the fall was very light, 0.73 inch on October 25 and 26 and 0.28 inch on November 24. This kept the peas alive until the winter rains started in December. In the spring there was sufficient rain until April 9. On April 27 the peas were past the full-bloom stage, and the stand was estimated at 85 per cent. The final growth was good, 30 to 40 inches tall, and the yield of hay was 2,432 pounds and of seed 352 pounds per acre.

Athens, Ala.—The peas were sown broadcast and disked in October 5, 1924, on Decatur soil. The seeds were inoculated with commercial vetch culture, but only fair inoculation was found on the plants which survived. In the fall the rainfall was very light—only 0.51 inch from September 20 to December 7. The stand was estimated on May 1, 1925, at 15 per cent. Most of the seed did not germinate on account of the dry soil until December, and it was then too late for the plants to make much growth before cold weather arrived. The plants attained a height of 30 inches with rather scant foliage, and no attempt was made to obtain yield data because of the poor stand.

Greenville, Ala.—The peas were sown December 13, 1924, earlier seeding not being possible on account of the dry weather. It was very dry during both fall and spring, and only a fair stand was obtained. The final growth was only 6 inches tall, but annual yellow sweet clover, crimson clover, and hairy vetch on adjoining plats were complete failures.

W. R. DODSON, DEAN AND DIRECTOR, LOUISIANA AGRICULTURAL AND MECHANICAL COLLEGE, BATON ROUGE

Season of 1924–25.—One plat was seeded to the peas alone and one plat to a mixture of peas and oats. Two such plats were located on the highlands which have a loess soil, and two were on alluvial lands classed as moderately fine silt soil. On the alluvial lands practically all legumes that will grow at all here thrive without artificial inoculation. Alfalfa, sweet clover, cowpeas, soybeans, velvet beans, and vetch have nodules on their roots but the winter peas failed to produce nodules in either of the plats on this soil, and the test was a complete failure. On the loess soil of the highlands the results were somewhat better. No nodules were found, but a portion of the land produced a fairly good growth which would have made a moderately good crop of hay. About the time the plants began to put on pods, however, they became badly infected with downy mildew, and before the vines were mature they had been almost killed by the disease. Under the conditions of this test the Austrian Winter pea has little or no value as a forage crop in this locality.

CULTURAL DIRECTIONS

The following suggestions regarding the best date and rate of seeding, the necessity for soil inoculation, and the use of fertilizers apply more especially to the Atlantic Coastal Plain.

Date of seeding.—It is believed that for hay, cover-crop, and green-manure purposes the seedings should be made as early after Septem-

ber 15 as weather and soil conditions will permit. Earlier seedings stand less chance of winter injury and are hurt less by spring droughts. These conclusions are formed only from observations, and more extensive date-of-seeding experiments are required to establish the facts in regard to the most favorable date.

Rate of seeding.—Excellent results have been obtained in Georgia by seeding the Austrian Winter pea at the rate per acre of 25 pounds of the peas in mixture with 1 bushel of winter oats or one-half bushel of rye; if sown alone, 30 to 35 pounds of the peas were required to produce the desired stand. These rates are much lower than those recommended by European writers, and when the seed becomes more abundant and available at lower prices seeding 40 to 60 pounds per acre of the peas in mixtures with the small grains and 90 to 100 pounds alone will likely be found profitable.

Soil inoculation.—Inoculation is necessary on all the soils of the Coastal Plains that have not in recent years grown garden peas, field peas, or vetch. A quick and effective method of applying soil for inoculation purposes is by drilling screened soil which has been obtained from a field carrying inoculation through the fertilizer attachment on the ordinary grain drill as the peas are being seeded. Moist soil can not be drilled in this way, but in the fall dry soil is generally available. Since it is best to sow the peas immediately following a rain, it is a wise precaution to have the inoculated soil stored under a shelter where it can be kept in condition for drilling.

Pure cultures for inoculating the seed may be obtained through the United States Department of Agriculture or from commercial sources. These have the advantage of not adding any weed seed to the field where the peas are being sown. Unless care is exercised in applying these pure cultures, thorough inoculation is not as certain as when inoculated soil is used.

FERTILIZERS

In orchards, on cotton fields, or following tobacco where liberal quantities of fertilizers are applied in growing these crops, very little fertilizer is applied directly to the peas. Where the preceding crop has not been fertilized, a light application of acid phosphate or of a low-grade complete fertilizer is beneficial. Excellent results have been obtained from the use of 300 to 400 pounds of complete fertilizer applied directly to the peas when they are being grown for hay.

CONCLUSIONS

The accumulated data regarding winter peas are unsatisfactory in many ways. Those who have had an opportunity to see these peas growing at Washington, D. C., and Tifton, Ga., are justly enthusiastic over the future of this crop, but its range of usefulness will perhaps be limited to the southern Coastal Plain on the Atlantic coast and to the Pacific slope in Washington and Oregon. The trials to date indicate that winter peas are of little value in the North-Central States, and their behavior along the Gulf coast west of Georgia has not been encouraging. To some extent at least their poor showing in Alabama, Mississippi, and Louisiana is due to the subnormal rainfall which has characterized the last two seasons in these States. More information is needed from this section.

The tests of winter peas have been successful from Washington, D. C., southward along the Atlantic coast to Florida. Their value in the Piedmont section is doubtful, more especially in comparison with hairy vetch; but on the Coastal Plain of South Carolina and Georgia the winter pea promises to fill a distinct need for a hardy winter legume. At Tifton, Ga., this pea survived temperatures which completely killed all other varieties of peas as well as Fulghum oats, and notwithstanding unusually dry winters it has made consistently good yields of hay and green manure. It has been an outstanding success at that station and also on the Coastal Plain in South Carolina. If seed supplies can be grown locally or obtained elsewhere at reasonable prices there will be a rapid expansion in the acreage.

At Corvallis, Oreg., experiments have supplied additional evidence of the hardiness of the Austrian Winter pea. There it survived temperatures of −8° F. practically undamaged, and the yields, green weight, averaged 12 to 14 tons per acre. Such yields recommend its use as a silage crop in that section in addition to whatever value it may have as a winter cover and green-manure crop.

Tests for two years in southern California indicate that the Austrian Winter pea may be expected to yield more than 16 tons, green weight, per acre under irrigation. Other varieties of the field pea, however, as well as the common, hairy, and monantha vetches, outyield it, so that there will perhaps be little demand for it in that State.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

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